OMAHA AIRSPACE REDESIGN ENVIRONMENTAL ASSESSMENT

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TABLE OF CONTENTS

TABLE OF FIGURES

APPENDICIES

TABLE OF TABLES

CHAPTER I – PROJECT BACKGROUND AND PURPOSE AND NEED FOR THE ACTION

1.1 INTRODUCTION

In April of 1996, the FAA Administrator announced that the FAA would begin a comprehensive review and redesign of the United States Airspace. This endeavor became known as the National Airspace Redesign (NAR) project, which is part of the National Airspace System (NAS). The essence of NAR was to review all national airspace resources to determine if they provided for an efficient national airspace system. The goal of NAR was to: (1) increase system flexibility, predictability, and access; (2) maintain and improve system safety; (3) improve efficiency and reduce delays; and (4) support the evolution of emerging technologies. Each FAA region was tasked with identifying any national airspace system resources that needed to function more effectively and examine alternatives to correct any noted deficiencies.

The air traffic control procedures and airspace modifications proposed to meet the Purpose and Need for the Omaha Airspace Redesign (OAR) project were analyzed for their potential environmental impacts within this document. This environmental assessment (EA) evaluates the OAR project with respect to the environmental resource categories required by Federal law and regulation. It has been prepared pursuant to the requirements of the National Environmental Policy Act (NEPA) of 1969 (P.L. 91-190, 32 U.S.C. 3321 et. Seq.), the Federal Aviation Act of 1958 (Recodified as 49 U.S.C. Section 40101 et. Seq.), the Airport and Airway Improvement Act of 1987 (Recodified as 49 U.S.C. Section 47101, PL 97-238), and other laws as applicable. Additionally, the format and subject matter included in this document conforms to the requirements and standards of the FAA as set forth in FAA Order 1050.1E, *Environmental Impacts: Policies and Procedures*. Guidance provided in FAA Order 5050.4A, the *Airport Environmental Handbook*, has also been relied upon where relevant.

1.2 BACKGROUND

The OAR study area comprises portions of three states—Nebraska, Iowa, and Missouri. Figure 1-1 illustrates the study area, as well as the primary airport, Eppley Field (OMA), and the satellite airports of Lincoln Municipal and Offutt Air Force Base in the study area that were modeled with IFR operations based on the forecast of aviation demand.

This EA evaluates the potential impacts associated with alternative routings for aircraft flying under Instrument Flight Rule (IFR) procedures within a 55 nautical mile radius of Offutt Air Force Base (AFB). Although Eppley Field, located approximately 10 miles north of Offutt AFB, is the primary airport, Offutt AFB is the location of the regional terminal area radar.

This EA considers a no action alternative and an action alternative that address changes in aircraft routes and altitudes, as well as departure and arrival procedures.

1.3 AIRSPACE REDESIGN BACKGROUND

Air traffic controllers in three different types of facilities are responsible for separation of traffic. They are Air Route Traffic Control Centers (Centers), Terminal Radar Approach Control (TRACON) facilities, and Airport Traffic Control Towers (ATCTs). Control responsibility for aircraft is transferred from facility to facility as an aircraft departs its point of origin until it reaches its destination.

FIGURE 1-1 OAR STUDY AREA

According to the March 2005, FAA Administrator's Fact Book, there are 21 Centers throughout the United States. Centers are primarily responsible for control of aircraft during the high altitude en route phase of flight. Minneapolis Center has responsibility for separation services in Minnesota and portions of North and South Dakota, Iowa, Wisconsin, Michigan, Kansas, and Nebraska at altitudes generally above 15,000 feet (Figure 1-2). This EA primarily concerns the role Minneapolis Center has with regard to how traffic arrive and depart the Omaha TRACON airspace at from the Omaha TRACON, at altitudes of less than 18,000 feet.

TRACON facilities are responsible for aircraft operations in the general vicinity of one or more airports. Omaha TRACON airspace encompasses an area within an approximate 45 mile radius of Eppley Field. The study area also encompasses portions of the Lincoln, NE TRACON. After Minneapolis Center transfers control of arriving aircraft to the Omaha TRACON, controllers then assign and direct aircraft to a specific runway. Conversely Omaha TRACON controllers provide initial sequencing and separation of departing aircraft before transferring control to Minneapolis Center controllers, who then direct the aircraft toward their destination.

Controllers in air traffic control towers are responsible for providing control services to aircraft operating in the immediate vicinity of a particular airport or on airport property. Tower controllers direct aircraft as they taxi to/from runways and clear aircraft to takeoff and land. Eppley Field ATCT controllers are responsible for aircraft operations from the ground to 3,000 feet within the immediate vicinity of Eppley Field.

1.4 PURPOSE AND NEED

The existing airspace structure has evolved over several decades and uses a system of fixes, routes, and procedures to route aircraft through the area controlled by the Omaha TRACON. Historically, traffic volume in the Omaha airspace has not warranted the need for standardized arrival routes; aircraft were directed on an aircraft-by-aircraft basis through the airspace to their destination airport. Although this process can work well when traffic volumes are low, it becomes increasingly more difficult to route and track aircraft as traffic volumes increase. Traffic volume in the Omaha TRACON airspace is reaching the limits of a vector-based approach.

Increases in the volume of air carrier and air taxi traffic in the Omaha area, as well as increased operations in Minneapolis Center (ZMP) airspace have generated the need to structure air traffic procedures. The primary purpose of the Omaha Airspace Redesign project is to increase system predictability during time periods of high demand, thereby enhancing system safety. This would be accomplished through the redesign of airspace surrounding the Omaha area in order to simplify and standardize procedures that will reduce the number of pilot-to-controller and controller-to-controller voice communications during periods of high user demand. Standardizing the Omaha TRACON/ZMP transition procedures would reduce voice communications and increase the predictability of operations during these periods of peak user demand for Air Traffic Control (ATC) services. Standardization of procedures includes developing new routes and altitudes to be analyzed, charted and published into standardized procedures to allow for more predictable transition between the Omaha TRACON and ZMP en-route center during time periods of peak user demand for ATC services.

The specific goals of this redesign are to:

- Develop new standardized arrival routes that closely mirror current routes
- Develop new standardized routes and downwind procedures to accommodate increased traffic levels
- Reduce the need for coordination
    - Omaha TRACON – ZMP
    - Omaha TRACON – Lincoln Municipal Airfield (LNK)
- Reduce conflicts by limiting departures to areas not used for arrival routes.

The need for the project results from excessive voice communications to transmit and verify non-standard ATC operating procedures (i.e., radar vectoring). These communications increase pilot and controller workload and increase the probability of ATC instructions being misunderstood. Standardized procedures on the other hand increase pilot and controller procedural awareness, reduce voice communications and provide for a more balanced and predictable ATC environment.

The impacts of these operational inefficiencies extend far beyond the immediate Omaha area. The additional coordination calls between the Omaha TRACON and the Lincoln TRACON and ZMP increase the workload of the controllers responsible for the safe direction of other aircraft in the ZMP airspace, an area that extends over 300,000 square miles.

Benefits of Airspace Redesign

The MITRE Corporation examined the differences in flying distance between the baseline conditions and the proposed action. The proposed action would standardize approach procedures along delineated routes and reduce the use of radar vectoring.

The MITRE study examined this issue by using actual traffic flows from May 8, 2003 to evaluate the impact of the proposed action on aircraft flying distance. The study found that the average flying distance for air traffic was reduced 2% from baseline conditions.

Implementation year traffic volume, which is predicted to be greater then what was used in the MITRE study, would likely result in even greater benefit to the aviation community, since standardized air traffic procedures improve efficiency as traffic volumes increase. This increase in traffic would occur regardless of whether the OAR project is implemented.

FIGURE 1-2 STUDY AREA TRACONS AND ARTCC

CHAPTER II – ALTERNATIVES

Council on Environmental Quality (CEQ) regulations for implementing the National Environmental Policy Act (40 CFR Part 1502, Section 1502.14) and FAA regulations (FAA Order 1050.1E, paragraph 506e and FAA Order 5050.4A, paragraph 83) require that an agency (1) rigorously explore and objectively evaluate all prudent, feasible, reasonable, and practical alternatives, including alternatives not within the jurisdiction of the Federal agency; and for alternatives which were eliminated from detailed study, briefly discuss the reasons for their having been eliminated; and (2) devote substantial treatment to each alternative considered in detail, including the no-action alternative and the preferred alternative, so that reviewers may evaluate their comparative merits. Such examination ensures that an alternative that addresses the project's purpose and need, that might enhance environmental quality or have a less detrimental effect, has not been prematurely dismissed from consideration.

2.1 ALTERNATIVE DEVELOPMENT PROCESS

In early 2000, a three-member task force was developed to examine internal procedures for arrivals and departures in the Omaha area. The goal of this task force was to develop an airspace redesign plan that would provide a solution to the inefficiencies present in the current Omaha TRACON airspace design. This task force developed two airspace designs that it felt met the purpose and need of the project. These alternatives were identified as HOWRY and SALTI.

2.1.1 Alternatives Eliminated during Preliminary Analysis

Subsequent to developing the two airspace redesign alternatives, the alternatives were tested using AT Coach. AT Coach is an air traffic control simulator program that can be used to tests proposed procedures and determine their feasibility from an air traffic controllers' standpoint.

Based on these simulations, the following differences were observed:

- SALTI would require aircraft to descend over the Lincoln airspace, which would increase the amount of voice coordination between Lincoln and the Omaha TRACON
- SALTI included six arrival routes compared to the five in HOWRY. This additional route decreased the amount of airspace available for departures
- SALTI required more substantial changes to the arrival routes
- The arrival fixes for HOWRY were positioned further from Eppley Field which allows aircraft to make transition from the en route airspace to the arrival routes more gradually.

The AT Coach simulations showed that the SALTI alternative did not meet the goals outlined as the purpose of the airspace redesign. Based on the results of the AT Coach simulations, the SALTI alternative was eliminated from further analysis.

2.2 ALTERNATIVES CARRIED FORWARD FOR DETAILED ANALYSIS

2.2.1 No Action

The no action alternative includes no changes to the existing flight procedures. The no action alternative would not meet any of the needs detailed in Section 1.4. Figure 2-1 presents the modeled tracks for the current Omaha airspace. The complexity and inefficiency of the no action airspace can be seen in the figure. Arrival and departure routes use the same airspace and there are several areas of airspace not utilized by any

aircraft. When arriving and departing aircraft use the same airspace, controllers must split these flows by altitude, which increases controller workload.

Consideration of the no action alternative is required under NEPA per CEQ regulations as it serves as a basis for comparison to the proposed action alternative.

2.2.2 Proposed Action – HOWRY Alternative

The preferred alternative is the HOWRY alternative. Figure 2-2 illustrates the HOWRY alternative. The proposed action airspace would reduce the amount of airspace used by arriving aircraft, thereby separating arrival and departure flows. By standardizing the arrival routes, the amount of communication between controllers at the Omaha TRACON and ZMP would be reduced. None other alternatives were found to meet to the purpose and need of the proposed action.

TABLE 2-1 AIRSPACE REDESIGN TEAM EVALUATION OF ALTERNATIVES

Purpose and Need Alternatives Evaluation Categories/Goals	No Action	SALTI Alternative	Proposed Action HOWRY
Develop arrival routes that closely mirror current routes	●	◉	●
Develop standardized routes and downwind procedures to accommodate increased traffic levels	○	◉	●
Reduce the need for coordination			
Omaha TRACON – ZMP	○	◉	●
Omaha TRACON – Lincoln	○	○	●
Reduce conflicts by limiting departures to areas not used for arrival routes	○	◉	●

● Alternative has a **High** Probability of meeting Goal
◉ Alternative has an **Average** Probability of meeting Goal
○ Alternative has a **Low** Probability of meeting Goal

FIGURE 2-1 NO ACTION AIRSPACE

FIGURE 2-2 PROPOSED ACTION AIRSPACE ROUTING

CHAPTER III – AFFECTED ENVIRONMENT

The purpose of this chapter is to describe the character of the existing environment in which the proposed project would occur. Because neither the No-Action nor the Proposed Action Alternative involve land disturbances, the potential for environmental consequences is limited. Therefore, the discussion of the affected environment is limited to a description of only those environmental resources, which have the potential to be affected, mainly by aircraft noise.

3.1 STUDY AREA SETTING AND LOCATION

The airspace redesign study encompasses the area within a 55 NM radius centered on the ASR-9 terminal radar, which is located at Offutt Air Force Base, approximately 10 miles south of Eppley Field. Vertically, the study area extends to 18,000 feet above ground level (agl). The study area was delineated to include all areas where the proposed airspace redesign changes would occur. It was determined that the majority of the airspace changes affecting aircraft beyond 55 NM would be at altitudes where environmental impacts would not occur. Changes to the airspace within the study area would occur at an AGL greater than 3,000.

The study area does not include the airspace immediately surrounding all the airports in the study area. This area, within 5 miles of each airport, is used by the tower controllers to sequence aircraft to either take off or land and no changes are being proposed to these patterns as part of this project. Because the airspace within five miles of each airport will not be affected by the proposed project, these areas have been excluded from detailed analysis.

Geography

The study area extends over portions of three states, Nebraska, Iowa and Missouri (Figure 3-1). Portions of 35 counties are located within the study area. Two major cities are located within the study area, Omaha and Lincoln NE.

TABLE 3-1 COUNTIES WITHIN THE STUDY AREA

Nebraska	
Burt	Nemaha
Butler	Otoe
Cass	Pawnee
Colfax	Richardson
Cuming	Saline
Dodge	Sarpy
Douglas	Saunders
Gage	Seward
Johnson	Washington
Lancaster	
Iowa	
Adair	Mills
Adams	Monona
Audubon	Page
Cass	Pottawattamie
Crawford	Shelby
Fremont	Taylor
Harrison	
Missouri	
Atchison	Nodaway
Holt	

FIGURE 3-1 STUDY AREA

3.2 EXISTING LAND USE

Figure 3-2 presents land use classifications for the study area. Two major urban areas are located in the area, Omaha and Lincoln, NE. The remainder of the study area is dominated by agricultural land uses, with small towns dispersed throughout the region.

3.3 POPULATION AND DEMOGRAPHICS

Executive Order 12898 (White House, 1994) requires that Federal agencies determine the impact of their actions on minority and low-income populations and to ensure that these actions do not disproportionally impact these populations. This section describes the demographic characteristics of the study area population necessary to make such an assessment.

The study area encompasses the Omaha-Council Bluffs metropolitan area and outlying counties (see Figure 3-1). For larger cities, such as Omaha, the U.S Census Bureau recognizes that a substantial percentage of the population associated with a city may not reside within the city limits. Therefore, Metropolitan Statistical Areas (MSAs) were developed. MSAs include all towns, cities, and counties that are metropolitan in character and are economically and socially integrated with the central counties. For statistical purposes, the U.S. Census Bureau has defined the boundaries of the Omaha-Council Bluffs Metropolitan Statistical Area (MSA) as including the following counties (Figure 3-3).

- Nebraska – Cass, Douglas, Sarpy, Saunders, and Washington
- Iowa – Harrison, Mills, and Pottawattamie

A MSA has also been established for Lincoln NE. This MSA includes Lancaster and Seward counties.

Relevant demographic data for the Omaha MSA, the study area, Nebraska, Iowa, Missouri, and the United States are provided in Tables 3-2 and 3-3.

TABLE 3-2 1990 AND 2001 POPULATION DATA

Area	1990	2001	% Change
Nebraska			
State-wide	1,578,385	1,713,235	8.5%
Counties in Study Area	951,365	1,073,363	12.8%
Iowa			
State-wide	2,776,755	2,923,179	5.3%
Counties in Study Area	219,482	223,289	1.7%
Missouri			
State-wide	5,117,073	5,629,707	10.0%
Counties in Study Area	35,200	33,396	-5.1%
Omaha MSA	686,733	773,583	12.6%
Study Area	1,206,047	1,330,048	10.3%
United States	248,709,873	284,796,887	14.5%

Approximately 57% of the study area population lives within the Omaha MSA. Over 78% of the study area population lives in Nebraska, 18% lives in Iowa and less than 3% lives in Missouri. The population of the study area is growing at a faster pace than the statewide populations of any of the three states.

FIGURE 3-2 LAND USE

TABLE 3-3 DEMOGRAPHIC DATA

Area	% Minority Population	% Population Below Poverty Line
Nebraska		
State-wide	10.4%	9.7%
Counties in Study Area	14.7%	8.7%
Iowa		
State-wide	7.4%	9.1%
Counties in Study Area	4.4%	9.0%
Missouri		
State-wide	15.1%	11.7%
Counties in Study Area	3.5%	15%
Omaha MSA	16.2%	8.3%
Study Area	12.7%	8.9%
United States	24.9%	12.4%

The U.S. Census Bureau determines poverty based on a sliding scale that incorporates the number of persons in a household and the number of children in a household. The poverty threshold varies from $8,494 for a single person over the age of 65 to $32,606 for a household with eight adults and one child. The thresholds are updated on an annual basis and are intended to be used as a statistical tool rather than an accurate description of the amount of money a family needs to live.

The poverty rates in the study area are less than the overall poverty rates for Nebraska and Iowa and slightly higher than the statewide rate for Missouri. Other than the Missouri counties, poverty levels are also lower than the nation-wide average.

The minority populations in Nebraska, Iowa, and Missouri are lower than the US average. The Nebraska study area counties have a higher minority population than the state. The highest minority population is in the counties that make up the Omaha MSA.

3.4 WEATHER AND CLIMATE

This section describes the weather patterns for the study area in terms of precipitation levels, temperatures, and wind speeds. Also discussed are the local storm trends and potential storm impacts.

The study area is located between 39 and 41 degrees north latitude, straddling the Missouri River, which forms the boundary between Iowa and Nebraska. The area is alternately affected by warm moist air from the Gulf of Mexico and by drier, cold air from the north. The influence of these air masses creates a variable climate with warm, humid summers and cold conditions in the winter. On average, the summer high temperature is in the mid-80s and the average winter low is in the low teens.

The study area receives an average of 30.22 inches of precipitation per year. The summer months tend to be the wettest and the winter months are the driest.

Wind speeds average 9-10.5 miles per hour from the north/northwest. April is the windiest month, with an average wind speed of 12.9 mph.

3.5 STUDY AREA AIRPORTS

3.5.1 Study Area Airports

There are 24 public-use airports located in the study area. A representative traffic sample was used to build a baseline of the existing air traffic operations and overflights. This sample included IFR traffic into and out of two of these public-use airports, Eppley and Lincoln, and Offutt AFB. These airports are listed in Table 3.4.

FIGURE 3-3 OMAHA MSA

Most airports in the study area are intended to serve general aviation (GA) aircraft, including small piston powered aircraft and corporate jets. GA airports support commercial charter and flight training operations, and also support fire, police, and emergency medical services flight operations. GA airports often serve as reliever airports to larger airports such as Eppley Field, in that they provide an alternate location for GA operations and thereby help to reduce congestion at larger airports.

3.5.2 Existing Study Area Airspace

There are three major airports in the study area, 2 civilian airports; Eppley Airfield in Omaha, Lincoln Airport in Lincoln, and military installation; Offutt Air Force Base, south of Omaha. Traffic from these three airports was modeled in this study.

Eppley Airfield is the largest airport in the study area, servicing over 3.7 million passengers in 2003. Eppley currently operates three runways; a set of parallel runways (14/30) and a crosswind runway (18/36) oriented north/south.

Lincoln airport serves the Lincoln metropolitan areas as a commuter airport and includes three runways, two parallel runways running (17/35) and a crosswind runway extending NNW to the SE (14/32).

Offutt Air Force Base is the home of the 55th Wing. The 55th wing has responsibilities in worldwide reconnaissance, command and control communications, airlift and a full complement of support organizations. To accomplish such a diverse mission, the Wing uses 13 different models of 7 different aircraft types (Offutt AFB, 2005).

To help understand the limitations in the existing airspace structure within the study area, consider how air traffic flows to and from an airport. Fixed-wing aircraft must generally depart (takeoff) and arrive (land) into the wind, in order to increase aircraft performance (reduced takeoff and landing distance, and increased climb rate) and maintain safety. Runway use is generally determined by wind, but can also be affected by other factors such as weather, operational necessity and traffic demand.

Weather conditions such as low visibility and/or cloud ceiling can also affect runway selection, as some runways have enhanced Instrument Meteorological Conditions (IMC) capabilities and the availability of instrument approach procedures (e.g., Instrument Landing Systems, ILS). In the absence of wind and weather factors, operational necessity and traffic demand can determine runway selection as some runway flows have a higher operational capacity than others, due in part to runway layout.

Runway use configuration is the combination and orientation of runways that aircraft use at a particular time. It determines the direction of traffic flow at area airports. Traffic flows are established so that aircraft generally takeoff and land in the same direction; this increases both airport capacity and safety.

As previously stated, air traffic routes vary depending on the flow pattern in use at each airport. Departing aircraft are assigned to a route based upon the departure runway, and the flight's destination. Arriving aircraft are assigned to a route based upon the expected arrival runway, and the flight's origin and direction of approach to the destination airport. ATC operates in a systematic manner, such that flights between two airports (e.g., Eppley Field and Minneapolis-St. Paul) will typically be assigned to the same route. This ensures that ATC operates in a safe and efficient manner, and results in the establishment of the primary air traffic routes.

TABLE 3-4 AIRPORTS WITHIN THE STUDY AREA

ID	CITY	AIRPORT NAME	WHERE
OFF	*OMAHA, NE*	*Offutt AFB Airport*	*2.9 nm SE*
MLE	Omaha, NE	Millard Airport	7.3 nm WNW
OMA	Omaha, NE	Eppley Airfield Airport	10.3 nm NNE
PMV	Plattsmouth, NE	Plattsmouth Municipal Airport	11.6 nm SSE
CBF	Council Bluffs, IA	Council Bluffs Municipal Airport	11.9 nm NE
3NO	Omaha NE	North Omaha Airport	13.9 nm N
K46	Blair, NE	Blair Municipal Airport	17.9 nm NNW
AHQ	Wahoo, NE	Wahoo Municipal Airport	28.8 nm WNW
FET	Fremont, NE	Fremont Municipal Airport	31.0 nm NW
AFK	Nebraska City, NE	Nebraska City Municipal Airport	32.3 nm S
RDK	Red Oak, IA	Red Oak Municipal Airport	33.0 nm ESE
SDA	Shenandoah IA	Shenandoah Municipal Airport	34.3 nm SE
3Y4	Woodbine, IA	Woodbine Municipal Airport	38.0 nm NNE
TQE	Tekamah, NE	Tekamah Municipal Airport	38.6 nm NNW
HNR	Harland, IA	Harland Municipal Airport	38.9 nm NE
LNK	Lincoln, NE	Lincoln Airport	39.7 nm WSW
SCB	Scribner, NE	Scribner State Airport	41.0 nm NW
AIO	Atlantic, IA	Atlantic Municipal Airport	44.6 nm ENE
0G3	Tecumseh, NE	Tecumseh Municipal Airport	45.4 nm SSW
K01	Auburn, NE	Farington Field Airport	45.9 nm S
ICL	Clarinda, IA	Schenck Field Airport	49.6 nm ESE
K57	Tarkio, MO	Gould Peterson Municipal Airport	50.0 nm SSE
K36	Onawa, IA	Onawa Municipal Airport	52.2 nm N
93Y	David City, NE	David City Municipal Airport	52.3 nm W
CEK	Crete, NE	Crete Municipal Airport	53.5 nm SW
SWT	Seward, NE	Seward Municipal Airport	54.2 nm WSW

3.6 EXISTING NOISE ENVIRONMENT

Noise, simply defined as unwanted sound, can have an adverse effect on humans and their activities as well as on the natural environment. As part of the NEPA process, FAA requires that baseline noise levels be determined, and the impact of the proposed action be assessed for significance against the baseline conditions.

This section presents and discusses the science of noise modeling as well as the common metrics used to measure noise levels and assess noise impacts

Sound is carried through the atmosphere as small changes in atmospheric pressure, referred to as pressure waves. The intensity of a sound can be directly measured as the difference between atmospheric pressure and the pressure of the sound wave. Pressure is commonly expressed in the pressure unit Pascals (Pa) however, the range of the human ear, from imperceptible sound to painful sounds, extends from 0.00002 Pa to 20 Pa. Values in ranges that span several orders of magnitude are difficult to

compare and therefore, the Decibel scale was developed as a means to compare the ratio of a sound level to the minimal sound perceptible by the human ear.

The Decibel (dB)

The decibel is the most common measurement of noise. The dB scale is logarithmic and spans the normal range of human hearing. A dB reading of 0, roughly equivalent to 0.00002 Pa, represents the quietest sound the average human can hear. Sounds that occur at above 120-130 dB are typically painful. Table 3-5 gives real-world examples of sounds at various decibel levels.

The decibel scale is logarithmic; therefore, a ten-fold increase in the intensity of a noise results in a decibel increase of 10. Because the scale is logarithmic, decibel readings from different noise sources cannot be added. For example, the decibel level in an area in which two cargo trains passing by, each with a noise intensity of 80 dB is approximately 83 dB, not 160 dB. Additionally, loud noises tend to cancel out or override quieter noises. In an area where a cargo train was passing by, conducting a normal conservation would not increase the overall dB level for the area. The sound from the cargo train is so much louder that the conversation noise has an insignificant impact on the overall noise level.

In real-world environments, most people cannot distinguish noise changes of less than 3dB and generally perceive a 3-6 dB increase in noise levels to be a doubling of loudness.

TABLE 3-5 NOISE LEVELS FOR COMMON SOUNDS

Decibel level (dB)	Typical source
130	Jet plane (100 ft)
120	Amplified rock and roll (6 ft)
110	Motorcycle without a muffler (7 m)
100	Diesel truck (30 ft)
90	Food blender (3ft)
80	Cargo train (15 m)
70	Inside a moving car
60	Normal conservation
50	Quiet street
40	Library
30	Taping studio
20	Whisper
10	Rustling leaves
0	Threshold of sound perception

Decibel A (dBA)

In addition to differences in pressure, noise waves may vary in frequency. Frequency, expressed in cycles per second, hertz (Hz), is a measure of the number of times that a sound pressure wave repeats itself each second. Although the human ear can perceive sounds with frequency ranging from 20 to 15,000 Hz, it is most attuned to sounds with frequencies in the range of 1,000 – 4,000Hz. In order to account for the selectively of the human ear, the dBA scale was developed. This scale diminishes the weight of high (above 10,000 Hz) and low (below 500 Hz) frequency noises in the same pattern as the human ear. The dBA scale gives a more accurate assessment of the impact of a given sound on the human ear and it is therefore the scale used in most noise impact studies.

Sound Exposure Level (SEL)

Sound exposure level is a frequently used aviation noise metric that is used to compare noise events of varying duration. A SEL reading is the total accumulated noise generated during an event expressed as the dBA level required to generate the same amount of noise in one

second. For example, a noise event that creates a 70 dB noise for two seconds has a greater impact than a similarly loud event that lasts only one second. Because SEL readings are normalized to one second, the two second event would have a higher SEL reading. By including both the duration and the intensity of a noise event, in its calculation, SEL readings are ideal for determining overall noise exposure levels.

Equivalent Sound Level (Leq)

The equivalent sound level can be viewed as the mean noise level for a given point for a specific duration of time. Typically, Leq levels are presented for a period of interest, such as 24-hour day, nighttime, work day, etc. Noise levels rise and fall constantly and Leq is a metric that normalizes the high and low noise levels and presents a single dB value for a given location. This single value allows for easier comparison of noise levels between locations. As is the case for all decibel measurements, the scale is logarithmic, and therefore, loud events dominate the calculations.

Day-Night Average Sound Level (DNL)

DNL values are calculated using the same method as Leq values except that a 10db "penalty" is added to all noise events that occur between 10pm and 7am. This penalty accounts for the increased sensitivity of communities to nighttime noise. Generally, noise levels decline during nighttime hours and noises during this period are considered more disruptive than similarly loud events during daytime hours.

Federal agencies have accepted DNL as the preferred metric for use in noise impact studies. FAA Order 1050.1E requires that the cumulative noise exposure of individuals be established using DNL.

Development of Population Database

The noise impact analysis models used in this study calculate noise metrics for specific points. To ensure that the analysis is as accurate as possible, the population centroids of census blocks were chosen as the analysis points. Population centroids are the geographical center of census blocks and all population and demographic data in the block is assigned to this point. Census blocks are the smallest geographic unit for which the Census Bureau calculates data. During the 2000 Census, the United States was divided into over 7 million Census blocks. These blocks had an average population of approximately 41 persons.

3.7 AIR QUALITY

This section describes the existing air quality conditions within the airspace study area.

Pollutants Considered

To protect public health, the U.S. Environmental Protection Agency (EPA), under the authority of the Clean Air Act (CAA), has established National Ambient Air Quality Standards (NAAQS) for six criteria pollutants (Table 3-6). The General Conformity Rule (40 CFR Part 93, Subpart B) identifies the following National Ambient Air Quality Standards (NAAQS) criteria pollutants as pollutants of concern:

- Carbon Monoxide (CO)
- Nitrogen Dioxide (NO_2)
- Particulate Matter (PM-10)
    - Less than 10 micrometers in diameter
    - Less 2.5 micrometers in diameter
- Hydrocarbons (HC)/Volatile Organic Compounds (VOCs)
- Sulfur Dioxide (SO_2)
- Ozone (O_3)

These "Primary", health-based standards are intended to protect public health, including sensitive populations (asthmatics, the elderly, and children). The EPA requires each state to identify areas that have attained the NAAQS for criteria pollutants. A geographic area in which the levels of an air pollutant meet the health-

based, primary standard is designated an "attainment" area. If a geographic area has a level higher than the Federal primary standard for any air pollutant, it is designated a "nonattainment" area for that pollutant. Because each of the criteria pollutants is measured separately, a geographic area may be an attainment area for one pollutant and a nonattainment area for another at the same time.

Areas designated as nonattainment areas must prepare a state implementation plan (SIP) that describes how the area will reduce pollutant levels and come into attainment with the NAAQS.

All counties within the study area are in attainment with all NAAQS.

3.8 HISTORICAL, ARCHAEOLOGICAL, ARCHITERCTURAL, AND CULTURAL RESOURCES

Several federal laws and regulations protect cultural resources, which include prehistoric, historic, architectural, and traditional cultural properties. Section 106 of the National Historic Preservation Act of 1966 (16 U.S.C. 470 *et seq*.) requires Federal agencies to take into account the effect of the undertaking on any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register. The Federal agency must also coordinate with the state historic preservation officers (SHPOs) which are responsible for reviewing National Register of Historic Places (NHRP) nominations, maintaining data on historic properties that have been identified but not yet nominated, and consulting with Federal agencies during Section 106 review.

A map of all cultural resources within the study area is provided in Figure 3-4. A list of all cultural resources can be found in Appendix B. A brief discussion of the cultural resources within the study area is provided below.

3.8.1 Nebraska

The National Register of Historic Places lists 279 properties within the Nebraska study area counties. These sites include several historic bridges and county courthouses. Noise impacts were modeled at all of these locations.

3.8.2 Iowa

The National Register of Historic Places lists 122 properties within the Iowa study area counties. Noise impacts were modeled at all of these locations.

TABLE 3-6 NATIONAL AMBIENT AIR QUALITY STANDARDS

Criteria Pollutant	Time Basis	Primary Standards	Violation Criteria
Ozone (O_3)	1-hour	0.12 ppm	More than 3 days in 3 years
	8-hour	0.08 ppm	More than 1 day/year
Particulate Matter			
PM_{10}	24-hour	150 µg/m^3	More than 1 day/year
	Annual arithmetic mean	50 µg/m^3	If Exceeded
$PM_{2.5}$	24-hour	65 µg/m^3	> 98th % of conc in a year
	Annual arithmetic mean	15 µg/m^3	More than 1 day/year
Carbon Monoxide	8-hour	9.0 ppm	More than 1 day/year
	1-hour	35 ppm	More than 1 day/year
Nitrogen Dioxide	Annual arithmetic mean	0.053 ppm	If Exceeded
Lead	Calendar Quarter	1.5 µg/m^3	If Exceeded
Sulfur Dioxide	Annual arithmetic mean	0.030 ppm	If Exceeded
	24-hour	0.14 ppm	More than 1 day/year

ppm = parts per million
Source: U.S. EPA, 2001

3.9 SECTION 303(C) RESOURCES 4(F)

The Department of Transportation Act, 49 U.S.C. Section 303(c), states that special effort should be made to preserve the natural beauty of the countryside and public park and recreation lands, wildlife and waterfowl refuges, and historic sites.

The impacts of transportation programs or projects on publicly owned land of a public park, recreation area, or wildlife and waterfowl refuge of national, State, or local significance, or land of an historic site of national, state, or local significance (as determined by Federal, State, or local officials having jurisdiction over the park, area, refuge, or site) must be assessed and avoided where possible. Indirect impacts, such as noise, may substantially impair activities, features, or attributes of Section 303(c) resources are considered a "constructive use" of the resource.

3.9.1 Federally-managed Lands

Several Federal Agencies, including the National Park Service, U.S. Forest Service (USFS), and the U.S. Fish and Wildlife Service (USFWS) manage properties for conservation of natural resources. A list of all federally managed properties is presented in Table 3-8. Figure 3-5 contains a map depicting the locations of these properties. Noise impacts were modeled at all of these locations.

FIGURE 3-4 NATIONAL REGISTER OF HISTORIC PLACES LOCATIONS

3.9.2 State Parks and Forests

Nebraska, Iowa, and Missouri have designated and manage natural and cultural resource areas for use by their citizens. A list of all state-managed properties is presented in Table 3-7. Figure 3-5 contains a map depicting the locations of these properties. Noise impacts were modeled at all of these locations.

TABLE 3-7 STUDY AREA PARKS

Iowa Parks	
Clarinda City Park	Manti Park
Cold Springs State Park	McComb Park
Decatur Bend Park	Nelson Park
Elk Horn Park	Nodaway Valley County Park
Fountain Square Park	Pilot Grove County Park
Freedom Park	Pioneer County Park
Garfield Park	Prairie Rose State Park
Glenwood Lake Park	Preparation Canyon State Park
Griswold Park	Priest Park
Hacklebarney Woods County Park	Riverview Marina State Park
Huff Access County Park	Sunnyside Park
Lake Anita State Park	Tyson Island State Wildlife Management Area
Lake Icaria Co Recreation Area	Tzaak Walton Park
Lewis City Park	Viking Lake State Park
Lincoln Park	Waubonsie State Park
Manteno County Park	Windmill Lake County Park
Nebraska Parks	
Adams Park	Kirkman Recreational Area Park
Arbor Lodge State Historic Park	Kountze Park
Athletic Park	Levi Carter Park
Barnard Park	Logan Park
Benson Park	Mandan Park
Boyd Park	Masonic Park
Branch Oak Lake State Park	McKinley Park
Brown Park	Memorial Park
Christie Heights Park	Miller Park
City Park	Milliken Park
Cold Springs State Park	Moeller Park
Columbus Park	Morton Park
Conoco Park	Mount Vernon Gardens
Coryell Park	N.P. Dodge Memorial Park
Dahlman Park	Oak Park
Deer Park	Pawnee Lake State Park
Drexel Park	Peony Park
Eugene Mahoney State Park	Pipal Park
Fillmore Park	Ralston Park
Fort Atkinson State Park	Roberts Park
Fort Kearny State Historical Park	Rockbrook Park
Gallagher Park	Schramm State Park
Glen Cunningham Park	Seymour L. Smith Park
Hanscom Park	Spring Lake Park
Harrison Heights Park	Stagecoach Lake State Park
Heartland of America Park	Standing Bear Lake Park
Highland Park	Tranquility Park
Hitchcock Park	Upland Park
Hummel Park	Wagon Train Park
Indian Cave State Park	Walnut Grove Park
Kellom Park	Wildewood Park
	Zorinsky Lake Park

3.10 THREATENED AND ENDANGERED SPECIES

Section 7 of the Endangered Species Act (16 U.S.C. 1531-1544) requires that federal agencies insure that any action authorized, funded, or carried out by the agency "is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species."

A threatened species is one that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. An endangered species is one that is in danger of extinction throughout all or a significant portion of its range.

FIGURE 3-5 PROTECTED NATURAL AREAS

FAA Order 1050.1E requires that the FAA complete Section 7 coordination with the US Fish and Wildlife Service (USFWS) or the National Marine Fisheries Service (NMFS) to determine the potential impact of a project on threatened and endangered species prior to the commitment of irreversible or irretrievable resources.

Lists of Federally-listed threatened and endangered species are presented in Tables 3-8 and 3-9.

3.11 MIGRATORY BIRDS

The Missouri River basin and its associated lakes and wetlands, provide ideal stopover locations for migrating birds. Migratory birds do not generally fly at altitudes greater than 10,000 feet and the majority of avian flights occur at altitudes of less than 3,000 feet. This preference for low-level flight is a major reason why river valleys are heavily used as flyway. The Missouri river valley provides a pathway to the Great Plains and Central Canada that is uninterrupted by mountains or hills.

3.12 WILD AND SCENIC RIVERS

The Wild and Scenic Rivers Act of 1968 (PL.90-542) was instituted to protect and preserve in free-flowing condition, river segments which with their immediate environments, possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values. The Wild and Scenic Rivers Act limits development within 1,000 feet of segments of a river designated as Wild or Scenic.

Missouri has one river segment designated a Wild or Scenic River by the Department of Interior. The Eleven Point River, between Thomasville in south central Missouri, and the Highway 142 Bridge, to the southeast has been protected due to its scenic qualities. No portion of the river flows through the study area.

In Nebraska, there are three river segments designated as Wild and Scenic Rivers, two portions of the Missouri River totaling 98 miles and one 104-mile segment of the Niobrara River. All three of these river segments are located along the Nebraska/South Dakota border and none are within the study area.

There are no river segments designated as Wild or Scenic in Iowa.

TABLE 3-8 FEDERALLY LISTED THREATENED AND ENDANGERED FAUNA

Status	Common Name	Latin Name	State Listed		
			Nebraska	Iowa	Missouri
E	Bat, Indiana	*Myotis sodalis*		v	v
E	Bat, gray	*Myotis grisescens*			v
E	Bat, Ozark big-eared	*Corynorhinus (=Plecotus) townsendii ingens*			*v*
T	Eagle, bald (lower 48 States)	*Haliaeetus leucocephalus*	v	v	v
E	Higgins eye (pearlymussel)	*Lampsilis higginsii*		v	v
T	Plover, piping (except Great Lakes watershed)	*Charadrius melodus*	v	v	v
E	Shiner, Topeka	*Notropis topeka (=tristis)*	v	v	v
E	Snail, Iowa Pleistocene	*Discus macclintocki*		v	
E	Sturgeon, pallid	*Scaphirhynchus albus*	v	v	v
E	Tern, least (interior pop.)	*Sterna antillarum*	v	v	v
T	Wolf, gray Eastern Distinct Population Segment	*Canis lupus*	v	v	v
E	Beetle, American burying	*Nicrophorus americanus*	v		
E	Crane, whooping (except where XN)	*Grus americana*	v		
E	Curlew, Eskimo	*Numenius borealis*	v		v
T	Madtom, Neosho	*Noturus placidus*			v
E	Mucket, pink (pearlymussel)	*Lampsilis abrupta*			v
E	Mussel, scaleshell	*Leptodea leptodon*			v
E	Pearlymussel, Curtis	*Epioblasma florentina curtisii*			v
E	Pocketbook, fat	*Potamilus capax*			v

Key: E – Endangered T – Threatened XN – Experimental Population (Non-Essential)

TABLE 3-9 FEDERALLY LISTED THREATENED AND ENDANGERED FLORA

Status	Common Name	Latin Name	State Listed		
			Nebraska	Iowa	Missouri
T	Monkshood, northern wild	*Aconitum noveboracense*		v	
T	Milkweed, Mead's	*Asclepias meadii*		v	v
T	Bush-clover, prairie	*Lespedeza leptostachya*		v	
T	Orchid, eastern prairie fringed	*Platanthera leucophaea*		v	
T	Orchid, western prairie fringed	*Platanthera praeclara*	v	v	v
T	Butterfly plant, Colorado	*Gaura neomexicana var. coloradensis*	v		
E	Penstemon, blowout	*Penstemon haydenii*	v		
T	Ladies'-tresses, Ute	*Spiranthes diluvialis*			v
T	Aster, decurrent false	*Boltonia decurrens*			v
T	No common name	*Geocarpon minimum*			v
T	Sneezeweed, Virginia	*Helenium virginicum*			v
T	Bladderpod, Missouri	*Lesquerella filiformis*			v
E	Pondberry	*Lindera melissifolia*			v
E	Clover, running buffalo	*Trifolium stoloniferum*			v

CHAPTER IV – ENVIRONMENTAL CONSEQUENCES

This chapter describes the environmental consequences of each of the alternatives selected for detailed consideration in accordance with FAA Order 1050.1E.

4.1 NOISE

The community exposure to aircraft noise attributable to the no action conditions and the proposed action are presented in this section. The analysis includes determination of aircraft noise exposure in the study area as forecasted for the years 2006 and 2011. Aircraft noise is often the most noticeable environmental effect associated with aviation projects. If the sound is sufficiently loud or frequent in occurrence, it may interfere with various human activities or be considered objectionable

4.1.1 Aircraft Noise Analysis

This analysis showed how aircraft noise would change with the proposed action in comparison to the no action conditions. A detailed analysis of noise from aircraft operating between the surface and 18,000 feet above ground level (AGL) was performed at 74,496 locations throughout the study area. The noise analysis evaluated conditions for specific locations on the ground based on population centroids (centers of census tracts) and grid points (parks, historic sites, etc) using the Day/Night Average Sound Level (DNL) for aircraft operations. The number of people exposed to noise was determined as the number residing in the census tract corresponding to the centroid (based on 2000 Census Data). Population centroids are center points of census tracts, which are statistical subdivisions of a county and do not cross county boundaries. The spatial size of census tracts varies widely depending on the density of the population. For this analysis, the population centroid counts represented the maximum potential population within the census tract that could be exposed to modeled DNL levels. A total number of 35,805 centroids were analyzed. Additionally, DNL noise levels are also calculated for some 38,165 uniform grid locations spaced at 0.5 nautical miles (approximately 3,000 ft) apart covering the entire OAR study area. The remainder of the points analyzed covered various parks and historic sites.

Noise exposure contours which are typically used in aircraft noise analysis near a specific airport were not calculated for this study because the computer model (FAA's INM) normally used to assess noise impacts cannot be applied to widespread areas, nor can the INM model evaluate high-altitude flight route changes. Noise exposure contours only describe noise impacts of arrivals and departures operating within the immediate vicinity (3-5 miles) of the study airport for aircraft operating below 3,000 feet above the ground. The FAA's Noise Integrated Routing System (NIRS) provides a more detailed analysis tool to evaluate the effects of high-altitude airspace changes from the ground level to 18,000 feet AGL on noise sensitive areas over a large study area. Therefore, NIRS was used in this assessment.

4.1.2 Noise Model

Three airports within the OAR study area were fully evaluated in this analysis. In addition, over flight traffic transiting the study area below 18,000 ft MSL altitude was also included in the modeling. Eppley Field was the major airport modeled, Offutt Air Force Base and Lincoln airport were also modeled as traffic volumes at these airports are high enough that it necessary to consider these airports in any regional airspace redesign.

4.1.3 Input Data

NIRS requires a variety of user-supplied input data including a mathematical description of the airport runways, operations by aircraft type,

flight tracks, and runway utilization. Airport layouts within the study area are used as the source for runway descriptions. Operation levels, a mix of different aircraft types (fleet mix), and airspace segment and stage length (trip length) are based on the design day flight schedules developed for each planning timeframe. Design day flight schedules contain information about the following: the type of flight (scheduled and nonscheduled commercial passenger, air cargo, general aviation, or military); type of aircraft; arrival and departure times; the origin and destination of the flight (domestic or international); the operator of the flight; and the local airspace arrival and departure segments.

The direction and path the aircraft fly (flight tracks) throughout the study area for all three airports modeled were based on actual flight radar data, drawn in collaboration with FAA controllers, and dispersed using statistical analysis of the radar tracks making up a specific route or procedure.

The day and night distribution of operations were provided in the design day schedules developed in the operational forecasting effort. Operations for Eppley Field and Lincoln were derived from the FAA's January 2004 edition of the Terminal Area Forecast (TAF). Military operations at Offutt AFB are limited to military aircraft, and are not influenced by market demand. Offutt AFB operations were assumed to remain constant across all three analysis years (2003, 2006, 2011).

These distributions were then compared to the air traffic control operational simulation (i.e., Total Airspace and Airport Modeler – TAAM) output for the proposed action and adjusted for delay as necessary. The relevance of maintaining correct nighttime proportions lies within the DNL metric's weighting of nighttime noise levels by 10 dB. This is done to take into account the lower ambient noise levels occurring at night as well as the intrusive nature of noise when people are trying to sleep. In essence, one nighttime flight equates to ten daytime flights. This addition of noise energy is accomplished in the NIRS model itself

The runway use percentages define which runways are to be used for arrivals and departures on an average annual basis. For Eppley Field and Offutt AFB, runway use was determined from a 60-day radar sample taken in the summer and fall of 2003 (see Appendix A). For Lincoln, runway use was determined using the airport's Part 150 study. Runway use does not vary between the no action and proposed action.

4.1.4 Noise Impact Criteria

The FAA has considered the matter of threshold levels above which aircraft noise causes a significant adverse impact on people. The agency has established 65 DNL as the threshold above which aircraft noise is considered to be not compatible in residential areas. In addition, the FAA has determined that a significant impact occurs if a proposed action would result in an increase of 1.5 DNL or more on any noise-sensitive area within the 65 DNL exposure level.

In 1992, the Federal Interagency Committee on Noise (FICON) recommended that noise increases of 3 dB or more between DNL 60 and 65 dB be evaluated in environmental studies when increases of 1.5 DNL or more occur at noise-sensitive locations at or above 65 DNL. Increases of this magnitude below 65 DNL are not to be considered as "significant impacts," but they are to receive consideration. The FAA adopted FICON's recommendation into FAA Order 1050.1E.

In 1990, the FAA issued a noise screening procedure for determining whether certain airspace actions above 3,000 feet above ground level (AGL) might increase DNL levels by five decibels or more. The procedure served as a response to FAA experience that increases in noise of 5 dB or more at cumulative levels well below 65 DNL could be disturbing to people and become a source of public concern. In the Environmental Impact Statement for the Expanded East Coast Plan (EECP), the FAA evaluated noise levels down to the 45 DNL level for potential increases in DNL noise exposure of 5 dB or more. In the EECP study, the FAA determined that the 45 DNL level was the

minimum level at which noise needed to be considered because "even distant ambient noise sources and natural sounds such as wind in trees can easily exceed this [45 DNL] value." This threshold of change was subsequently used in the Chicago Terminal Airspace Project (CTAP) EIS and the Potomac Consolidated TRACON Airspace Redesign EIS.

For the purpose of this EA, increases of 3 DNL between 60 and 65 DNL are considered "slight to moderate impacts" as are increases of 5 DNL or greater at levels between 45 DNL to 60 DNL. The increase in noise at these levels is enough to be noticeable and potentially disturbing to some people, but the cumulative noise level is not high enough to constitute a "significant impact." Table 4.1 summarizes the criteria utilized to assess the level of change in noise exposure attributable to the proposed actions.

4.1.5 Aircraft Noise Impact

The NIRS noise analysis focuses on aircraft noise exposure in areas affected by DNL 45 and greater. NIRS evaluates the maximum potential population exposed to noise based on the criteria presented in Table 4.1. Table 4.2 presents the maximum potential population exposed to noise by DNL ranges for the no action and proposed alternative. Table 4.3 displays the FAA's noise categories and shows how people have shifted among these categories between the no action and the proposed action.

TABLE 4-1 CRITERIA FOR DETERMINING IMPACT OF INCREASES IN AIRCRAFT NOISE

DNL Noise Exposure With Proposed Action	Minimum Increase in DNL With Proposed Action	Level of Impact	Reference
65 dB or higher	1.5 dB	Significant	FAA Order 1050.1E, App. A, 14.3 Part 150, Sec. 150.21(2)(d) FICON 1992
60 to 65 dB	3.0 dB	Slight to Moderate	FAA Order 1050.1E, App A, 14.4c FICON 1992
45 to 60 dB	5.0 dB	Slight to Moderate	FAA Order 1050.1E, App A, 14.5e FAA Notice 7210.360

TABLE 4-2 MAXIMUM POTENTIAL POPULATION EXPOSED TO AIRCRAFT NOISE IN OAR STUDY AREA

	No Action Exposure	Proposed Action Exposure	Change
2006 Forecast			
45-60 DNL	218,550	234,454	15,904
60-65 DNL	6,873	6,888	15
65+ DNL	958	958	0
Total Above 45 DNL	226,381	242,300	15,919
2011 Forecast			
45-60 DNL	219,799	234,885	15,086
60-65 DNL	8,490	8,490	0
65+ DNL	42	42	0
Total Above 45 DNL	**228,331**	**243,417**	15,086

TABLE 4-3 MAXIMUM POTENTIAL POPULATION CHANGE – PROPOSED ACTION

Increase No Change Decrease

		2006 No Action				
	DNL (dB)	**<45**	**45-60**	**60-65**	**>65**	**Proposed Action**
2006 Alternative	**<45**	690,914	3299	0	0	694,213
	45-60	19,218	215236	0	0	234,454
	60-65	0	15	6,873	0	6,888
	>65	0	0	0	958	958
	No Action Total	710,132	218,550	6,873	958	936,513
		2011 No Action				
	DNL (dB)	**<45**	**45-60**	**60-65**	**>65**	**Proposed Action**
2011 Alternative	**<45**	690,423	2,673	0	0	693,096
	45-60	17,759	217,126	0	0	234,885
	60-65	0	0	8,490	0	8,490
	>65	0	0	0	42	42
	No Action Total	708,182	219,799	8,490	42	**936,513**

No Action

As shown in Table 4.2, approximately 226,381 people within the OAR study area are expected to be exposed to noise levels of 45 DNL and greater due to aircraft noise in 2006 if no design changes are made. By the year 2011, it is estimated that the population exposed to noise levels above 45 DNL will increase by 1,950 to 228,331. The number of person exposed to noise levels between 60 and 65 DNL would increase by 1,617. The number of people exposed to noise of 65 DNL and greater is expected to decrease by 916 to just 42 persons by 2011.

Proposed Action

The noise exposure associated with the proposed action was evaluated against the no action for each of the future years. Table 4.2 also presents the resulting maximum population potentially exposed to various noise levels for the proposed action in each future year. In 2006, 15,904 more people would be exposed to noise levels greater than 45 DNL. Of these, 15 people would be exposed to noise levels between 60 and 65 DNL.

In 2011, 431 additional persons would be exposed to noise levels greater than 45 DNL. No additional persons would be exposed to noise levels greater than 60 DNL. No persons were shifted into the 65DNL category with a less than 1.5 dB increase. No persons would be newly impacted by significant noise.

A more detailed discussion of the proposed action's routes and procedure changes from the no action condition is presented in Appendix A of this document. The appendix also provides discussion related to the changes in the NIRS input data to model the alternative routes and procedures along with a discussion of the resulting noise.

TABLE 4-4 OAR PROPOSED ACTION POPULATION IMPACT CHANGE ANALYSIS SUMMARY

	DNL Noise Exposure With Proposed Action		
	65 dB or higher	60 to 65 dB	45 to 60 dB
Minimum Change in DNL With Proposed Action	1.5 dB	3.0 dB	5.0 dB
Level of Impact	Significant	Slight to Moderate	Slight to Moderate
Noise Increases			
2006 Forecast			
Proposed Action	0	0	113
2011 Forecast			
Proposed Action	0	0	177
Noise Decreases			
2006 Forecast			
Proposed Action	0	0	92
2011 Forecast			
Proposed Action	0	0	92

4.1.6 Aircraft Noise Impacts– Summary

Table 4.4 presents a summary of the population impacts for the proposed action in terms of the FAA threshold criteria. The table is color-coded based on the centroid mapping scheme used by NIRS (see Appendix A). As the analysis indicates, the proposed action would increase noise exposure by more than 5dB to 113 people and decrease noise exposure by more than 5 dB to 92 persons in 2006. The net number of person exposed to a greater than 5 dB increase would be 21. In 2011, an additional 64 persons would be exposed to 5 dB increases. Appendix A provides a detailed explanation of the elements of the proposed action that contributed to these changes.

Overall, the noise exposure analysis indicates that the proposed action would result in an increase in the total number of persons exposed to aircraft noise above 45 DNL in 2011. This increase is slight, less than 2% of the total study area population and less than 0.04% of those

persons affected would experience noise increases of greater than 5 dB.

4.2 COMPATIBLE LAND USE

The compatibility of existing and planned land uses with aircraft operations is usually determined based on the extent of noise impacts around an airport.

As described in Section 4.1, Noise, the proposed action does not result in significant noise impacts. Additionally, noise levels in the study area have been compared with the land uses set forth in the FAA land use compatibility table contained in FAA Order 1050.1E. All land uses were found to be compatible. Therefore, it can be concluded that there would be no significant impacts as it relates to compatible land uses.

4.3 SOCIOECONOMIC IMPACTS, ENVIRONMENTAL JUSTICE, AND CHILDRENS' ENVIRONMENTAL HEATLH AND SAFETY RISKS

Neither the no action nor the proposed action would require the relocation of residences or businesses, disrupt local surface transportation patterns, or cause any losses in community tax base. Therefore, there would be no socioeconomic impacts.

No significant environmental impacts for any impact category have been identified for either the no action or the proposed action. Moreover, those areas that would experience slight to moderate impacts, a 5dB increase in the 45-60 DNL range, do not contain a disproportionately high number of minority populations, low-income populations, or children. As such, it follows that there would be no disproportionately high or adverse impacts for minority populations, low-income populations, or children.

4.4 SECONDARY OR INDUCED IMPACTS

Neither the no action nor the proposed action would impact patterns in population movement or growth, service demands, or cause changes in business and economic activity. Therefore, there would be no secondary or induced impacts.

4.5 SECTION 303(C) RESOURCES

Neither the no action nor the proposed action would require direct or indirect taking of any Section 303(c) property. Therefore, there would be no impacts with regard to Section 303(c) resources.

4.6 HISTORICAL, ARCHITECTURAL, ARCHAEOLOGICAL, AND CULTURAL RESOURCES

Neither the no action nor the proposed action would require direct or indirect taking of any historical, architectural, archaeological, or cultural resources. Therefore, there would be no impact with regard to these environmental impact categories.

FIGURE 4-1 CHANGE AT NOISE CENTROIDS
PROPOSED ACTION VS. NO ACTION 2006

FIGURE 4-2 CHANGE AT NOISE CENTROIDS
PROPOSED ACTION VS. NO ACTION 2011

4.7 WILD AND SCENIC RIVERS

There are no wild and/or scenic river segments within the study area. Therefore, neither the no action nor the proposed action have the potential to impact these resources.

4.8 FISH, WILDLIFE, AND PLANTS

4.8.1 Wildlife

Commercial air traffic has increased during an extremely successful period of wildlife management in North America. Aggressive natural resource programs by public and private wildlife management groups have contributed to impressive increases in populations of many species. At the same time, Canada geese, coyotes, deer, and other wildlife have expanded into suburban and urban areas, including airports, and are thriving in response to changes to habitats in these areas. These concurrent increases in air traffic and wildlife populations contribute to an increased probability of wildlife strikes. As these proposed action would primarily alter air traffic routes at greater than 3,000 AGL, the risk of strikes to animals other than birds is minimal.

4.8.2 Migratory Birds

Migratory birds do not generally fly at altitudes greater than 10,000 feet and the majority of avian flights occur at altitudes of less than 3,000 feet. This preference for low-level flight is a major reason why the Missouri river valley is such a heavily used flyway. The Missouri River, in conjunction with the Mississippi, provides a 3,000 mile pathway to the north that is uninterrupted by mountains or hills.

The Missouri/Mississippi River basin is used as a flyway for over 40% of all Northern American waterfowl and 326 bird species migrate through or inhabit the river basin. The flyway which serves as a major migration route for neotropical migrants and migratory waterfowl, and is a major resting area for birds.

During the period 1990-1999, 27,433 bird strikes were reported to the FAA as provided in Table 4.5. Bird strikes, will in all likelihood, continue to increase, especially as commercial air traffic increases. However, most of the increase in strikes is likely to be seen below 1,000 feet AGL, as resident bird populations (i.e., Canada geese) use the undeveloped areas that lie adjacent to most airports.

The distribution of reported bird strikes by altitude during the period of 1990 through 1999 is the subject of Table 4.6. About 55 percent of the bird strikes occurred within 100 feet of the ground, 78 percent occurred under 900 feet AGL. Based on historical bird strike patterns in Table 4.6, 91 percent occurred under 3,000 feet AGL and approximately 9 percent of all bird strikes occurred above 3,000 feet AGL.

The proposed action presented in this EA involves flight paths that are above 3,000 feet AGL. Therefore, based on the available information from the FAA National Wildlife Strike Database, it was concluded that the impacts to migratory bird patterns resulting from the proposed action would be minimal and not significant.

TABLE 4-5 NUMBER OF REPORTED AVIAN STRIKES BY IDENTIFIED SPECIES FOR CIVIL AIRCRAFT, USA, 1990-1999

Species	10-Year Totals
Ducks, Ducklike and Miscellaneous Swimming Birds	1,486 (Waterfowl 1,447)
Seabirds, Gulls, Etc. (Aerialists)	3,628 (Gulls 3,570)
Long-legged Wading Birds	431
Smaller Wading Birds	433
Birds of Prey	1,666 (Raptors 1,379)
Fowl-like Birds	70
Nonpaserine Land Birds	1,509 (Doves 1,473)
Passerine (Perching) Birds	3,247 (Starlings 636; Blackbirds 730; Sparrows 916)
Total Known Birds	12,470
Unknown Birds	14,929
Total Birds	27,399

Source: Cleary, E.C., Wright, S.E., and Dolbeer, R.A. 2000.
FAA National Wildlife Strike Database, Serial Report Number 6.

TABLE 4-6 NUMBER OF REPORTED BIRD STRIKES TO CIVIL AIRCRAFT BY ALTITUDE (FEET) ABOVE GROUND LEVEL (AGL), USA, 1990-1999 REPORTED STRIKES

Altitude of Strike (Feet in AGL)	10-Year Total	% of Total Known	% Cumulative Total
0	8,400	40	40.2
1-99	3,185	15	55.4
100-199	1,395	7	62.1
200-299	910	4	66.5
300-399	662	3	69.7
400-499	378	2	71.5
500-599	701	3	74.8
600-699	222	1	75.9
700-799	160	1	76.6
800-899	304	1	78.1
900-999	127	1	78.7
1,000-1,499	1,006	5	83.5
1,500-1,999	664	3	86.7
2,000-2,499	561	3	89.4
2,500-2,999	304	1	90.8
3,000-3,499	480	2	93.1
3,500-3,999	150	1	93.8
4,000-4,999	381	2	95.7
5,000-9,999	704	3	99.0
10,000-19,999	188	1	99.9
20,000-29,999	8	<1	100.0
≥ 30,000	2	<1	100.0

Source: Cleary, E.C., Wright, S.E., and Dolbeer, R.A. 2000. FAA National Wildlife Strike Database, Serial Report Number 6.

4.9 LIGHT EMISSIONS AND VISUAL IMPACTS

Neither the no action alternative nor the proposed action would affect the number of aircraft operations or involve the development of physical facilities. The proposed action would occur at altitudes greater than 3,000 feet and would not result in additional light sources. Therefore, there would be no impacts with regard to light emissions or visual impacts.

4.10 AIR QUALITY

The final rule for Determining Conformity of General Federal Actions to State and Federal Implementation Plans (40 CFR Parts 6, 51, and 93) was published in the Federal Register in 1993. In 51.853 (c)(2), the Environmental Protection Agency (EPA) lists actions that are *de minimis* and thus do not require an applicable analysis ender this rule. EPA states in the preamble to this regulation that it believes "air traffic control activities and adopting approach, departure, and en route procedures for airport operations" are illustrative of *de minimis* actions.

As such, no further analysis is required. The proposed action fits within this exemption, therefore no significant impacts to air quality.

4.11 NATURAL RESOURCES AND ENERGY SUPPLY

The proposed action would not affect the airport's stationary facilities or movement of ground vehicles.

Implementation of the proposed action could alter fuel consumption to a very slight degree. However, any change would be insignificant.

Therefore, neither the no action alternative nor the proposed action would result in the depletion of local supplies of energy and/or natural resources.

4.12 HAZARDOUS MATERIALS, POLLUTION PREVENTION, SOLID WASTE, AND CONSTRUCTION IMPACTS

Neither the no action alternative nor the proposed action involves construction activity. Therefore, there would be no impacts with regard to construction activity, hazardous materials, or solid waste. As such, there is no need to address pollution prevention.

4.13 WATER QUALITY, WETLANDS, AND FLOODPLAINS

Neither the no action nor the proposed action would result in the development of facilities. Therefore there would be no impacts with respect to water quality, wetlands, or floodplains.

4.14 COASTAL RESOURCES

The project area is not located in a coastal zone or included in a Coastal Zone Management Program. Therefore there would be no impacts with respect to coastal resources.

4.15 FARMLANDS

Neither the no action nor the proposed action would result in the development of facilities. Therefore there would be no impacts with respect to farmlands.

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CHAPTER VI – REFERENCES

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CHAPTER VII – LIST OF ABBREVIATIONS, ACRONYMS, AND GLOSSARY

7.1 LIST OF ACRONYMS AND ABBREVIATIONS

AFB Air Force Base

AGL Above Ground Level

ARTCC Air Route Traffic Control Center

ATC Air Traffic Control

ATCT Airport Traffic Control Tower

CAA Clean Air Act

CEQ Council on Environmental Quality

CFR Code of Federal Regulations

CO Carbon Monoxide

CTAP Chicago Terminal Airspace Project

dB Decibel

dBA A-Weighted Decibel

dBC C-Weighted Decibel

DNL Day-Night Average Sound Level

DOT Department of Transportation (United States)

EA Environmental Assessment

EECP Expanded East Coast Plan

EIS Environmental Impact Statement

EPA Environmental Protection Agency (United States)

FAA Federal Aviation Administration

FICON Federal Interagency Committee on Noise

GA General Aviation

HC Hydrocarbons

Hz Hertz

IFR Instrument Flight Rules

ILS Instrument Landing System

IMC Instrument Meteorological Conditions

INM Integrated Noise Model

Leq(24) 24-hour Equivalent Sound Level

Lmax Maximum A-weighted Sound Level

LNK Lincoln Municipal Airport

MSA Metropolitan Statistical Areas

MSL Mean Sea Level

NAAQS National Ambient Air Quality Standards

NAS National Airspace System

NAR National Airspace Redesign

NAVAID Navigation Aid

NEPA National Environmental Policy Act

NIRS Noise Integrated Routing System

NM Nautical Mile

NMFS National Marine Fisheries Service

NO2 Nitrogen Dioxide

NOx Nitrogen Oxides

NOI Notice of Intent

NPS National Park Service

NRHP National Register of Historic Places

O3 Ozone

OAR Omaha Airspace Redesign

OFF Offutt Air Force Base

OMA Eppley Field

PA Pascals

PM-10 Particulate Matter less than 10 micrometers in diameter

RNAV Area Navigation

ROD Record of Decision

SEL Sound Exposure Level

SHPO State Historic Preservation Officer

SIP State Implementation Plan

SO2 Sulfur Dioxide

STAR Standard Terminal Arrival Route

TAAM Total Airspace & Airport Modeler Plus

TAF Terminal Area Forecast

TRACON Terminal Radar Approach Control

USFWS United States Fish and Wildlife Service

USFS United States Forest Service

VHF Very High Frequency

VFR Visual Flight Rules

VMC Visual Meteorological Conditions

VOC Volatile Organic Compound

ZMP Minneapolis Center

7.2 GLOSSARY OF TERMS

A-Weighted Sound Level – A quantity, in decibels, read from a standard sound-level meter with A-weighting circuitry. The A-weighting scale discriminates against the lower frequencies below 1000 hertz according to a relationship approximating the auditory sensitivity of the human ear. The A-weighted sound level is approximately related to the relative "noisiness" or "annoyance" of many common sounds.

Acoustics – The science of sound, including the generation, transmission, and effects of sound waves, both audible and inaudible.

Air Carrier – An entity holding a Certificate of Public Convenience and Necessity issued by the Department of Transportation to conduct scheduled air services over specified routes and a limited amount of non-scheduled operations.

Air Pollutant – Any substance in air that could, in high enough concentration, harm man, other animals, vegetation, or material. Pollutants may include almost any natural or artificial composition of airborne matter capable of being airborne. They may be in gases, particulates, or in combinations thereof. Generally, they fall into two main groups: (1) those emitted directly form identifiable sources and (2) those produced in the air by interaction between two or more primary pollutants, or by reaction with normal atmospheric constituents, with or without photoactivation.

Air Route Traffic Control Center (ARTCC) – An FAA facility established to provide air traffic control service to aircraft operating on an IFR flight plan within controlled airspace and principally during the en-route phase of flight. When equipment capabilities and controller workload permit, certain advisory/assistance services may be proved to VFR aircraft.

Air Taxi – An air carrier certificated in accordance with Part 135 and authorized to provide, on demand, public transportation of persons and property by aircraft. Generally operates small aircraft "for hire" for specific trips.

Air Traffic Control (ATC) – A service operated by appropriate authority to promote the safe, orderly, and expeditious flow of air traffic.

Airman's Information Manual – A publication containing basic flight information and ATC procedures designed primarily as a pilot's information and instructional manual for use in the National Airspace System.

Airport Traffic Control Tower (ATCT) – A facility that uses air/ground communications, visual signaling, and other devices to provide ATC services to aircraft operating in the vicinity of an airport. Authorizes aircraft to land or take-off at the airport controlled by the tower regardless of flight plan or weather conditions.

Airspace – Navigable area used by aircraft for purposes of flight.

Airway – A control area or portion of established in the form of a corridor, the center line of which is the defined by radio navigational aids. The network of airways serving aircraft operations up to but not including 18,000 feet MSL are referred to as "Victor" airways. The network of airways serving aircraft operations at or above 18,000 feet MSL are referred to as "Jet " airways.

Altitude – Height above a reference point, usually expressed in feet. Reference points are typically sea level, the ground, or airfield elevation in which case MSL, AGL or AFE further describes the altitude, respectively.

Ambient Noise Level – The level of noise that is all-encompassing within a given environment for which a single source cannot be determined. It is usually a composite of sounds from many and varied sources near to and far from the receiver.

Area Navigation (RNAV) – A method of navigation that permits aircraft operation on any desired course within the coverage of station-referenced navigation signals or within the limits of a self-contained system capability.

Arithmetic Averaged Sound Pressure Level – The arithmetic sum of a series of sound pressure levels divided by the number of levels included in the sum.

Arrival Stream – A flow of aircraft that are following similar arrival procedures.

Automated Radar Terminal System (ARTS) – Computer-aided radar display subsystems capable of associating alphanumeric data-such as aircraft identification, altitude, and airspeed-with aircraft radar returns.

Attainment Area – An area in which the Federal or state standards for ambient air quality are being achieved.

Azimuth – An arc of the horizon measured between a fixed point (as true north) and the vertical circle passing through the center of an object.

Block – Census blocks are small areas bounded on all sides by visible features such as streets, roads, streams, and railroad tracks, and by invisible boundaries such as city, town, township, and county limits; property lines; and short, imaginary extensions of streets and roads. Blocks are numbered uniquely within each census tract or block numbering area (BNA). A three-digit number identifies a block, sometimes with a single alphabetical suffix. The U.S. Bureau of Census designates census blocks.

Centroid – A point representing the geographic center of a US Bureau of Census census block.

Clearance – see Air Traffic Clearance.

Climb – The act or instance of increasing altitude.

Conformity – A determination that a project conforms with a State Implementation Plan (SIP) whose purpose is to eliminate or reduce the severity and number of violations of the National Ambient Air Quality Standards; and does not impede the scheduled attainment of such standards.

Controlled Airspace – Airspace of defined dimensions within which air traffic control service is provided to IFR flights and to VFR flights in accordance with the airspace classification.

Corner Post – An airspace structure wherein arriving aircraft are routed to one of four arrival fixes located at the corners of the TRACON airspace, at approximately 90-degrees from one another. A straight track from the arrival fix to the major airport is used to route arriving aircraft; therefore, there are four primary arrival routes in a corner post system. Departing aircraft are routed via several departure routes that use the airspace between the arrival routes. This effectively segregates arriving and departing aircraft into different sections of airspace.

Cost-Benefit Analysis – A means of quantitatively evaluating all benefits and costs incurred throughout a project's economic life.

Criteria Pollutants – The 1970 amendments to the Clean Air Act required EPA to set National Ambient Air Quality Standards for certain pollutants known to be hazardous to human health. EPA has identified and set standards to protect human health and welfare for six pollutants: ozone, carbon monoxide, total suspended particulates, sulfur dioxide, lead, and nitrogen oxide. The term, "criteria pollutants" derives from the requirement that EPA must describe the characteristics and potential health and welfare effects of these pollutants. It is on the basis of these criteria that standards are set or revised.

de minimis Levels – de minimis levels are levels and vary according to the type of pollutant and severity of the non-attainment area. These levels are consistent for all conformity determinations (unless the State chooses to set lower de minimis levels and apply the conformity requirements to non-federal as well as Federal entities). The calculation of total project emissions is made and compared to these de minimis cutoffs. If the emissions for a pollutant are above de minimis, the project requires a conformity determination. All

emissions from the project must be analyzed and found to conform, not only those above the de minimis levels.

Departure – The act of an aircraft taking off from an airport.

Departure Procedure (DP) – A preplanned IFR ATC departure procedure printed for pilot use in graphic and/or textual form. DP's provide transition from the terminal to the appropriate en route structure.

Descent – The process of decreasing altitude.

Distance Measuring Equipment (DME) – Equipment (airborne and ground) used to measure, in nautical miles, the slant-range distance of an aircraft from the DME navigational aid.

Day-Night Average Sound Level (DNL) – A measure of the annual average noise environment over a 24-hour day. It is the 24-hour, logarithmic- (or energy-) average, A-weighted sound pressure level with a 10-decibel penalty applied to the nighttime event levels that occur between 10 p.m. and 7 a.m.

Decibel (dB) – Commonly used to define the level produced by a sound source. The term used to identify 10 times the common logarithm of two like quantities proportional to power, such as sound power or sound pressure squared.

Downwind – in the direction in which the wind blows; with the wind behind.

Emissions – Pollution discharged into the atmosphere from stationary sources such as smokestacks, surface areas of commercial or industrial facilities, residential chimneys, and from mobile sources such as motor vehicles, locomotives, or aircraft exhausts.

Energy-Averaged Sound Pressure Level – The logarithmic sum of the sound power of a series of sound pressure levels divided by the number of levels included in the sum.

Enplanement – the total number of revenue passengers boarding aircraft, including originating, stopover, and transfer passengers, in scheduled and non-scheduled services.

En Route Airspace – A general term to describe the airspace controlled by an ARTCC.

Environmental Impact Statement (EIS) – An EIS is a document that provides a discussion of the significant environmental impacts which would occur as a result of a proposed project, and informs decision-makers and the public of the reasonable alternatives which would avoid or minimize adverse impacts. Public participation and consultation with other federal, state, and local agencies is a cornerstone of the EIS process.

Environmental Noise – Unwanted sound from various outdoor sources that produce noise. Environmental noise sources include aircraft, cars, trucks, buses, railways, industrial plants, construction activities, etc.

Equivalent Sound Level (Leq, LAEQ, LAEQD or LAEQN) – The level of a constant sound which, in the given situation and time period, has the same average sound energy, as does a time-varying sound. Specifically, equivalent sound level is the energy-averaged sound pressure level of the individual A-weighted sound pressure levels occurring during the time interval. The time interval over which the measurement is taken (or for which the metric is computed) should always be specified. For example, if the time interval is the daytime period (7 a.m. to 10 p.m.) then the acronym LAEQD is used. Similarly, if the time interval is the nighttime period (10 p.m. to 7 a.m.) then the acronym LAEQN is used.

Expanded East Coast Plan (EECP) – A comprehensive revision (prepared in 1986 and implemented in stages) of IFR routes and procedures above 3,000 feet. The plan was designed, to restructure routes to and from the New York metroplex to complement improved terminal ATC procedures, to reduce delays, to adjust arrival and departure corridors and facilitate air traffic management.

Federal Aviation Administration (FAA) – The Federal Aviation Administration (FAA) is the element of the United States government with primary responsibility for the safety of civil aviation. Among its major functions are the regulation of civil aviation to promote safety and fulfill the requirements of national defense and development and operation of a common system of air traffic control and navigation for both civil and military aircraft.

Federal Airway – see Airway

Filed Altitude – The initial altitude filed on the flight plan.

Fix – A geographical position determined by reference to the surface, by reference to one or more NAVAIDs or area navigation (RNAV) (including GPS).

Flight Data Information – Specific information used by ATC for an individual flight. This includes information such as aircraft identification, destination, type, route, and altitude.

Flight Data Processing System – The system used to store and track flight data information.

Flight Level (FL) – A level of constant atmospheric pressure related to reference datum of 29.92 inches of mercury. Each FL is expressed in three digits representing hundreds of feet. For example FL 250 represents a barometric altitude of 25,000 feet. Aircraft operating at altitudes greater than 18,000 feet MSL in the United States use Flight levels as their altitude reference.

Flight Management System (FMS) – A computer system that contains a database of NAVAIDS, fixes, IAPs, and airports that allows routes to be preprogrammed. The system is constantly updated with respect to position accuracy (x, y, and z coordinates) by reference to conventional navigational aids.

Flight Track – The route used by an aircraft in flight.

Flight Track Utilization – The amount and type of aircraft that use a specific flight track, on either departure or arrival.

Frequency (acoustic) – The number of oscillations per second completed by a vibrating object.

Gates – see Ingress/Egress Transfer Points

General Aviation (GA) – All civil aviation except scheduled passenger and cargo airlines.

Global Positioning System (GPS) – A satellite-based radio positioning and navigation system operated by the Department of Defense. The system provides highly accurate position and velocity information, and precise time, on a continuous global basis to an unlimited number of properly equipped users.

Hand-Off – An action taken to transfer the radar identification of an aircraft from one controller to another if the aircraft will enter the receiving controller's airspace and radio communications with the aircraft will be transferred.

Heading – A compass bearing indicating the direction of travel.

Hertz (Hz) – The unit used to designate frequency; specifically, the number of cycles per second.

Household – A household includes all the persons who occupy a housing unit. The occupants may be a single family, one person living alone, two or more families living together, or any other group of related or unrelated persons who share living arrangements.

Housing Unit – A housing unit is a house, apartment, a mobile home or trailer, a group of rooms or a single room occupied as separate living quarters or, if vacant, intended for occupancy as separate living quarters.

Hub – Airport that serves as a focus of an air carrier's route structure. Flights from many cities converge at the focal airport permitting

passengers to connect to other points in the route structure. See also Hubbing.

Hubbing – The practice of having a large number of aircraft (from a single carrier) arrive at the "hub" airport during a compressed time frame. Passengers are exchanged between aircraft to various destinations and all aircraft depart within a compressed time period.

Hydrocarbons (HC) – Chemical compounds that consist entirely of carbon and hydrogen.

Ingress/Egress Transfer Points – A fix used by ATC to transfer control of aircraft from one facility's area of jurisdiction to another facility's area of jurisdiction. (i.e., ARTCC to TRACON).

Instrument Approach Procedure (IAP) – A series of predetermined maneuvers for the orderly transfer of an aircraft under instrument flight conditions from the beginning of the initial approach to a landing or to a point from which a landing may be made visually.

Instrument Flight Rules (IFR) – Rules governing the procedures for conducting instrument flight. Also a term used by pilots and controllers to indicate type of flight plan.

Instrument Meteorological Conditions (IMC) – Weather conditions expressed in terms of visibility, distance from clouds, and cloud ceilings during which all aircraft are required to operate using Instrument Flight Rules (IFR).

Integrated Noise Model (INM) – A computer program developed, updated and maintained by the Federal Aviation Administration to evaluate aircraft noise impacts in the vicinity of airports.

Inter-Facility Boundary – Boundary of two adjacent ATC facilities.

Intra-Facility Boundary – Internal boundary in a ATC facility (i.e., a sector wall).

In-Trail Spacing – The distance between two aircraft on an identical route; one aircraft is following another.

Invasive Species – Invasive species are organisms (usually transported by humans) which successfully establish themselves in, and then overcome, otherwise intact, pre-existing native ecosystems.

Jet Stream – A migrating stream of high speed winds present at high altitudes.

Knots – Speed measured in nautical miles per hour.

Level Off – The process by which an aircraft that is initially changing altitude maintains a constant altitude. This can be done once the aircraft reaches its cruise altitude in the en route environment, or as a series of steps taken as the aircraft transition to/from the en route environment to guarantee adequate separation from other aircraft.

Loudness – The attribute of an auditory sensation, in terms of which sounds may be ordered on a scale extending from soft to loud. Loudness depends primarily upon the sound pressure of the source, but it also depends upon the frequency and waveform of the source.

Mean Sea Level (MSL) – The height of the surface of the sea for all stages of the tide, used as a reference for elevations. Also called sea level datum.

Mean Surface Wind Speed – Average wind velocity calculated at the surface or at ground level elevation.

National Airspace System (NAS) – The NAS is the common network of air navigation facilities, equipment and services, airports or landing areas; aeronautical charts, information and services; rules, regulations and procedures, technical information, and manpower and material.

National Ambient Air Quality Standards (NAAQS) – Standards for criteria pollutants established by United States Environmental Protection Agency that apply to outdoor air.

Natural Areas – Undeveloped areas of land such as parks, wildlife refuges/management areas, and nature preserves.

Nautical Mile (NM) – A measure of distance equal to 1 minute of arc on the earth's surface (approximately 6,076 feet).

Navigation Aids (NAVAIDs) – Any visual or electronic device airborne or on the surface which provides point to point guidance information or position data to aircraft in-flight.

Noise – Any sound that is undesirable because it interferes with speech and hearing, or is intense enough to damage hearing, or is otherwise annoying.

Noise Abatement Procedure – Measures taken to reduce the off-airport impacts of aircraft noise. Procedures developed by airport operators in cooperation with the FAA, and local community officials, to mitigate aircraft noise near airports.

Noise Exposure – The cumulative acoustic stimulation reaching the ear of a person over a specified period of time (e.g., a work shift, a day, a working life, or a lifetime).

Noise Integrated Routing System (NIRS) – A computer program developed, updated, and maintained by the Federal Aviation Administration to evaluate aircraft noise impact for air traffic actions involving multiple airports over broad geographic areas.

Non-Attainment Area – Areas with levels that exceed one or more of the National Ambient Air Quality Standards for the criteria pollutants designated in the Clean Air Act.

Operation – Landing or take-off of an aircraft.

Overflights – Aircraft whose flights originate or terminate outside the controlling facility's area that transit the airspace without landing.

Piston Driven Aircraft – Propeller driven aircraft powered by an internal combustion engine.

Positive Control – The separation of all air traffic within designated airspace by air traffic control.

Power Settings – Amount of engine power used by the pilot.

Quadrant – A quarter part of a circle, centered on a NAVAID oriented clockwise from magnetic north.

Radar (primary) – A device which, by measuring the time interval between transmission and reception of radio pulses, and correlating the angular orientation of the radiated antenna beam, or beams in azimuth and/or elevation, provides information on range, azimuth, and /or elevation of objects in the path of the transmitted pulses. Also known as Primary Radar.

Radar (secondary) – A radar system in which the object to be detected is fitted with cooperative equipment in the form of a radio receiver/transmitter (transponder). Radar pulses transmitted from the searching transmitter/receiver (interrogator) site are received in the cooperative equipment and used to trigger a distinctive transmission from the transponder. This reply transmission, rather than a reflected signal, is then received back at the interrogator site for processing and display at an ATC facility. Also known as a radar beacon.

Radial – A magnetic bearing extending from a VOR/VORTAC/TACAN navigation facility.

Receiver – The listener or measuring microphone that detects the sound transmitted by the source.

Satellite Navigation – see Global Positioning System

Sector – A defined volume of airspace, including both lateral and vertical limits, in which a single air traffic controller is responsible for the safe movement of air traffic. A TRACON's or ARTCC's airspace is comprised of multiple sectors.

Scoping – The early and open process for determining the scope of issues to be addressed and for identifying the significant issues related to a proposed action. Scoping is also used to eliminate from detailed study the issues that are not significant or have been covered by prior environmental review.

Separation – Spacing between aircraft. This spacing may be vertical, lateral, longitudinal and visual.

Sequencing – Procedure in which air traffic is merged into an orderly flow.

Silent Hand-offs – Transfer of control from one air traffic controller to another by electronic means only. No voice communications are used.

Sound Exposure Level (SEL) – A time-integrated metric (i.e., continuously summed over a time period) which quantifies the total energy in the A-weighted sound level measured during a transient noise event. The time period for this measurement is generally taken to be that between the moments when the A-weighted sound level is 10 dB below the maximum.

Sound Pressure Level – A measure, in decibels, of the magnitude of the sound. Specifically, the sound pressure level of a sound that, in decibels, is 10 times the logarithm to the base 10 of the ratio of the squared pressure of this sound to the squared reference pressure. The reference pressure is usually taken to be 20 micropascals. (See also Energy-Averaged Sound Pressure Level.)

Source (acoustic) – The object that generates the sound.

Standard Terminal Arrival (STAR) – A preplanned instrument flight rule (IFR) air traffic control arrival procedure published for pilot use in graphic and/or textual form. STAR's provide transition from the en route structure to an outer fix or an instrument approach fix/arrival waypoint in the terminal area.

Statute Mile (SM) – A measure of distance equal to 5,280 feet.

Sulfur Dioxide (SO2) – Sulfur dioxide typically results from combustion processes, refining of petroleum, and other industrial processes.

Tactical Air Navigation (TACAN) – An ultra high frequency electronic air navigation aid which provides equipped aircraft a continuous indication of bearing and distance to the station.

Terminal Area – A general term used to describe airspace in which approach control services for airport traffic control service is provided.

Terminal Radar Approach Control (TRACON) – An FAA ATC facility which uses radar and two way radio communication to provide separation of air traffic within a specified geographic area in the vicinity of one or more large airports.

Time Above (TA or TALA) – The TA noise metric provides the duration in minutes for which aircraft-related noise exceeded a specified A-weighted sound level. If not stated otherwise, TA pertains to a 24-hour day. For example, a TA65 (or TALA65) of 17 minutes means that 65 dB was exceeded for a total of 17 minutes of the course of a 24-hour day.

Topography – The configuration of a surface including its relief and the position of its natural and man made features.

Tower – see Airport Traffic Control Tower

Transfer Points – see Ingress/Egress Transfer Points

Transition Area – see Controlled Airspace

Transport Category Aircraft – Aircraft certified in accordance with 14 C.F.R. Part 25.

Turboprop Aircraft – An aircraft whose main propulsive force is provided by a propeller driven by a gas turbine. Additional propulsive

force may be provided by gas discharged from the turbine exhaust.

Vector – Heading instructions issued by ATC to provide navigational guidance by radar.

Visual Meteorological Conditions (VMC) – Weather conditions expressed in terms of visibility, distance from cloud, and ceiling equal to or better than specified minima.

Visual Flight Rules (VFR) – Rules that govern the procedures for conducting flight under visual conditions. The term 'VFR' is also used in the United States to indicate weather conditions that are equal to or greater than minimum VFR requirements. In addition, it is used by pilots and controllers to indicate type of flight plan.

Volatile Organic Compound (VOC) – Any organic compound that participates in atmospheric photochemical reactions except those designated by EPA as having negligible photochemical reactivity.

VOR (Very High Frequency Omni-directional Radio Range Station) – A ground-based electronic navigation aid transmitting very high frequency navigation signals, 360° in azimuth, oriented from magnetic North. DME may be installed. Used as a basis for navigation in the National Airspace System.

VORTAC (Very High Frequency Omni-directional Range with Tactical Air Navigation) – A navigation aid providing VOR azimuth, TACAN azimuth, and TACAN distance measuring equipment (DME) at one site. The most common form of radio navigation currently in use.

Wake Turbulence – Phenomena resulting from the passage of an aircraft through the atmosphere. The term includes vortices, thrust stream turbulence, jet blast, jet wash, propeller wash, and rotor wash both on the ground and in the air.

Weighting – An additive (or subtractive) factor by which the sound pressure level at certain frequencies in an acoustic measurement is increased (or reduced) in order for that measurement to be more representative of certain simulated conditions.